



## Problems in diabetes management in school setting in children and adolescents with type 1 diabetes in Serbia

Problemi u kontroli dijabetesa tokom boravka u školi dece i adolescenata s dijabetesom tipa 1 u Srbiji

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### Abstract

**Background/Aim.** Children with type 1 diabetes typically spend one-third of the day in school and they should achieve the same level of diabetes management there as they do outside the school environment. The aim of this study was to identify problems in diabetes management in children with type 1 diabetes at school according to the perceptions reported by children and parents. **Methods.** This cross-sectional survey was carried out at nine public hospitals in Serbia with a cohort of 6–18-year old children/adolescents. The parents were personally informed about the objectives of the survey and the necessity to involve their children. The self-reporting questionnaire included demographic information as well as some questions that helped to evaluate the general situation of children with type 1 diabetes at school.

### Apstrakt

**Uvod/Cilj.** Deca sa dijabetesom melitusom tipa 1 obično provode trećinu dana u školi i trebalo bi da postignu isti nivo kontrole dijabetesa kao i izvan školskog okruženja. Cilj ovog istraživanja bio je da se uoče problemi dece sa dijabetesom tipa 1 u školi, uzimajući u obzir zapažanja i dece i roditelja. **Metode.** Ovo studija preseka sprovedena je u devet državnih bolnica u Srbiji kod dece/adolescenata uzrasta 6–18 godina. Roditelji su bili lično obavješteni o ciljevima istraživanja i potrebi da uključe svoju decu. Upitnik koji su sami popunjavali obuhvatao je demografske podatke, kao i neka pitanja koja treba da opišu opštu situaciju dece sa dijabetesom tipa 1 u školi. **Rezultati.** Dobijeni rezultati ukazuju da

**Results.** The obtained results show that not all children test blood glucose levels at school (50% of children in the 6–10-year-old age group and 67.3% in the age group over 11 years) and that not all children receive insulin at school (81.1% *vs* 18.9%, and 57.7% *vs* 42.3%, respectively). The frequency of severe hypoglycemia was 2.7% in children and 3.3% in adolescents. A high proportion of teachers did not have diabetes training. **Conclusion.** This brief report about problems in children and adolescents with type 1 diabetes at school in Serbia indicates what happens in the school setting and suggests how to improve control of this disease and facilitate the complete integration of children with diabetes at school.

**Key words:** diabetes mellitus, type 1; child; serbia; schools; questionnaires; preventive health services.

se u školi ne određuje nivo šećera u krvi (kod 50% dece starosti 6–10 godina i 67,3% dece starosti preko 11 godina) i da ne primaju sva deca insulin (81,1% *vs* 18,9% i 57,7% *vs* 42,3%). Učestalost ozbiljne hipoglikemije iznosila je 2,7% kod dece i 3,3% kod adolescenata. Veliki procenat nastavnika nije imao obuku za dijabetes. **Zaključak.** Ovaj kratak izveštaj o problemima školske dece i adolescenata sa dijabetesom tipa 1 u Srbiji ukazuje na stanje u školskom okruženju i na to kako bi se mogla poboljšati kontrola bolesti i olakšati njihov boravak u školi.

**Ključne reči:** dijabetes melitus, insulin-zavisni; deca; srbija; škole; upitnici; preventivno-medicinska zaštita.

## Introduction

Diabetes management in children and adolescents requires multiple daily management tasks that can challenge caregivers<sup>1</sup>. Nevertheless, the scientifically proven long-term health benefits of optimal diabetes control mandate that best efforts be made to control diabetes at school as well as at home<sup>1</sup>. The American Diabetes Association (ADA) and the American Association of Diabetes Educators issued very useful guidelines regarding optimal diabetes management in schools<sup>1-3</sup>. Children typically spend one-third of the day in school and they should achieve the same level of diabetes management there as they do outside the school environment. This means that children should incorporate frequent glucose monitoring, meal planning and possibly insulin injections at school, but also they should be allowed to participate fully and safely in all school activities<sup>4</sup>. The objective of this cross-sectional study was to identify the school problems of children with type 1 diabetes at primary and secondary school taking into account the perceptions reported both by the children older than 11 and by the parents of the children aged 6–10 years.

## Methods

This cross-sectional study was carried out in nine public hospitals in Serbia. The cohort of children was aged 6–18 years, which in Serbia is the age for primary (6–10, first four classes; 11–14, second four classes) and secondary school (15–18).

Recruitment took place between January 2013 and December 2013. The parents of those aged 6–18 with type 1 diabetes who attended the pediatric unit of each participating hospital were contacted by the diabetes educator and/or pediatrician. They were informed about the objectives of the study and about the need to include in the study their children/adolescents. In addition to information given by word of mouth, written information about the study was also given to each parent. The study was conducted only after the parents had given their oral informed consent. No interventions, nor treatments were given. The study did not require approval from the institutional review board at the hospitals.

A team of pediatrician endocrinologists from two tertiary care referral teaching hospitals in Belgrade, the capital city of Serbia, designed the questionnaire. Databases used were MEDLINE and PUBMED. The inclusion criterion for selecting studies was that the study focus was on special needs and general situation of children and adolescents at school<sup>4-7</sup>. Keywords used in the search were adolescent, child day care centers, type 1 diabetes, school. Some questions required a single answer [dischotomic (yes/no) or were on a hierarchic scale in which scores from 1 to 3 or 4 were assigned]. Other questions comprised multiple answers of precoded items. Once the questionnaire was approved by the endocrinologists of the University of Belgrade tertiary care hospitals, the project was presented to all major public hospitals in Serbia. All public hospitals agreed to participate.

Of the 346 questionnaires received, 346 (100%) were accepted, in that at least 90% of the questions were answered. The patients were divided into two age groups: 6–

10 years (younger age group) and over 11 years (older age group).  $\chi^2$  test and Fisher exact test were used to detect potential significant differences between the groups according to the age of children. Results were expressed as frequencies or means  $\pm$  SD unless otherwise stated. Probability values of less than 0.05 were considered to be significant. SPSS version 10.1 (SPSS, Chicago, IL) was used for analysis.

## Results

The 346 accepted questionnaires were completed by either the mother or the father of the child with type 1 diabetes (21.4%), or the adolescent itself (78.6%). Demographic characteristics of children with type 1 diabetes are shown in Table 1. Male and female gender were almost equally represented (53.2% and 46.8%, respectively). The median duration of diabetes (range) was 5.36 years (0.1–19.3), respectively. Most of the children and adolescents attended primary school (62.5%).

**Table 1**  
**Characteristics of the children (n = 346)**

Demography	n (%)
Age (year)	
6–10	74 (21.4)
>11	272 (78.6)
$\bar{x} \pm$ SD	13.9 ( $\pm$ 3.3)
Gender	
male	184 (53.2)
female	162 (46.8)
Duration of diabetes in years	
< 3	105 (30.3)
3–6	123 (35.6)
> 6	118 (34.1)
$\bar{x} \pm$ SD	5.4 ( $\pm$ 3.8)
Type of school	
primary	216 (62.4)
secondary	130 (37.6)
Other diseases	
no	277 (80.1)
thyroid alterations	24 (6.9)
celiac disease	10 (2.9)
other (dermatitis, asthma, allergies etc.)	35 (10.1)

Table 2 summarizes some of the results stratified *per* the age group. At school, 50% of children in the 6–10-year-old group and 67.3% in the age group over 11 years not underwent glucose monitoring during the school day ( $p < 0.05$ ), which they usually (73.0% vs 92.9%) performed without any assistance ( $p = 0.001$ ). Most of the children (81.1% and 57.7% respectively) did not take insulin at school ( $p = 0.001$ ), whereas the younger group did it with the help of a parent/relative (71.4%) and the older group did it by themselves (96.5%) ( $p < 0.001$ ). It was rare to find other personnel such as a teacher (0.9%) who administered insulin treatment, with injection or pump.

A rate of 2 in 74 children and 9 in 272 adolescents experiencing severe hypoglycemia requiring call to the emergency services suggests that as many as 2.7/3.3% of diabetic children could experience serious hypoglycemia in a given school year ( $p < 0.05$ ). A significantly lower percent of

Table 2

Selected questions and answers stratified by the age group			
Questions	6–10 yr n (%)	> 11 yr n (%)	<i>p</i>
Does the child require glucose monitoring at school? (n = 74/272)			
yes	37 (50.0)	89 (32.7)	0.043*
no	37 (50.0)	183 (67.3)	
If necessary, who helps the child to perform glucose monitoring? (n = 37/183)			
a teacher	3 (8.1)	3 (1.6)	0.001*
a family member	7 (18.9)	4 (2.2)	
a peer	/	6 (3.3)	
nobody	27 (73.0)	170 (92.9)	
Does the child need insulin administration at school? (n = 74/272)			
yes	14 (18.9)	115 (42.3)	0.001*
no	60 (81.1)	157 (57.7)	
During school time, who is the person responsible for insulin administration? (n = 14/115)			
nobody	4 (28.6)	111 (96.5)	< 0.001*
a parent/relative	10 (71.4)	2 (1.7)	
a teacher	/	1 (0.9)	
a peer	/	1 (0.9)	
Has the child ever experienced hypoglycemic episode at school requiring treatment with rapid-acting glucose? (n = 74/272)			
yes	6 (8.1)	38 (14.0)	0.201
no	68 (91.9)	234 (86.0)	
At your school, did some-one of the school staff know to administer glucagon? (n = 74/272)			
yes	2 (2.7)	7 (2.6)	0.277
no	40 (54.1)	140 (51.5)	
i don't know	32 (43.2)	125 (45.9)	
Is glucagon available in the first-aid kit at school? (n = 74/272)			
yes	3 (4)	27 (9.9)	0.239
no	19 (25.7)	74 (27.2)	
i don't know	52 (70.3)	171 (62.9)	
Have school personnel (physical education teacher, other teachers, or staff) received diabetes training? (n = 74/272)			
yes	1 (1.3)	23 (8.5)	0.043*
no	73 (98.6)	249 (91.5)	
Is the child worried about being different from her/his peers? (n = 74/272)			
yes	26 (35.1)	103 (37.9)	0.853
no	48 (64.9)	169 (62.1)	
Do you think that more information about diabetes would improve children's integration at school? (n = 74/272)			
yes	67 (90.5)	231 (84.9)	0.439
no	5 (6.8)	32 (11.8)	
maybe	2 (2.7)	9 (3.3)	

parents (1.3% vs 98.6%) and adolescents (8.5% vs 91.5%) indicated that their school personnel have no diabetes training.

### Discussion

This study shows that not all children and adolescents with type 1 diabetes in Serbian schools test their blood glucose levels and receive insulin at school, particularly the younger age group, due to reliance on parent/relative assistance.

Also, not testing blood glucose at school increases the risk of undetected hypoglycemia. The findings of about 3% occurrence of severe hypoglycemia in both age groups, requiring call to emergency services, show lack of any plan

for preventing and treating hypoglycemia. Because a large portion of a child's and adolescent's day might be spent at school, the management priority for them is the prevention, recognition, and treatment of hypoglycemia<sup>2,4,6,7</sup>.

It is disappointing that few participants reported diabetes training for school personnel. At the time of the study, the training of school staff in Serbia was not standard. Diabetes is a private affair involving only the families. So, it is likely that the degree of knowledge about the different aspects of diabetes still appears to be superficial for everyone other than those who are directly involved (patients/relatives), as has also been reported by other authors<sup>7,8</sup>.

Of interest here is an example of state intervention reported by Hellems and Clarke<sup>9</sup>, the so-called 'Virginia (USA)

experience': in 1999, this state passed legislation to ensure that any public school having one or more students with type 1 diabetes has to have at least two members of the teaching, administrative, or other staff (including coaches and cafeteria workers) instructed in the blood glucose monitoring, administration of insulin and glucagon when no registered nurse/physician was present. This legislation further provided immunity from liability for such non-medical personnel under the 'Good Samaritan' law and exempted these individuals from the nursing and medical practice acts when performing such diabetes treatment<sup>9</sup>. The American Diabetes Association (ADA) has developed the Safe at School Statement of Principles, which encoura-

ges all school districts to identify individuals who will be responsible for the safe management of children and adolescents with type 1 diabetes during attendance at school<sup>2</sup>.

### Conclusion

This first brief report on problems in diabetes management in school children and adolescents with type 1 diabetes in Serbia, suggests how to improve control of the disease in school setting. It is needed to develop a plan that includes a series of interventions involving health-care providers, parents and school staff to facilitate the complete integration of these children at school.

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